We claim:

1(original). A process for optimizing a molding temperature during flow of molten molding material into a mold cavity, the molding material to flow while molten in the mold cavity from at least one point of injection, along a flow path having a width defined by cavity walls, and the molten material transferring heat energy to the mold cavity for cooling and setting the molten material in a shape determined by the mold cavity, said transferring of heat energy being determined by temperatures and thermal properties of the molten material and the mold cavity, the process comprising the steps of:

providing a mold cavity controllable to a predetermined pre-injection temperature that is lower than a temperature at which the molding material sets, wherein the mold cavity can be heated temporarily by injection of the molten molding material at an injection temperature that is higher then said temperature at which the molding material sets and said material thereafter cools by transfer of heat energy into the cavity, to a post-injection temperature cool enough to harden the molding material;

determining a material flow path in the mold cavity between a point of injection of the molten molding material and a remote part of the mold cavity to be filled with the molten material by flow from the point of injection;

positing a pre-injection temperature of the cavity and an injection temperature of the molten material, and mathematically determining a thickness of a thermal insulation temperature booster at least along a part of the mold cavity along the flow path, such that a temperature of the molding material is elevated to an extent that the molding material remains at a temperature higher than the temperature at which the molding material sets, until the molding material has filled the mold cavity to form a molded article.

2(currently amended). The process of claim 1, wherein the thermal insulation temperature booster has a thickness substantially determined by the relationship:

$$(T-T_s)/(Tm-T_s)= \mathrm{erfc}(X)$$

$$\cancel{X=Z/(2*(\alpha*t)^\wedge 2)} \quad \underline{\mathbf{X=Z/(2*(\alpha*t)^\wedge(1/2))}}$$

Where: T-Ts is the amount of temperature increase to allow at the die side of booster layer. A range of 0.1 to 5 degrees C is recommended and 0.1 degree C preferred.

T_s is the temperature at the cavity surface side of the booster before contact by hot melt.

Tm is the desired cavity surface temperature during filling. A range of solidifying temperature plus 10 degrees C to 100 degrees C is recommended and the higher temperature is preferred.

α Is the thermal diffusivity of the booster layer material

t is the time to fill the cavity

Z is the thickness of the booster layer

erfc is a complementary error function. Tables of erfc that provide the value for X associated with the number from the left side of the equation are available on the internet and the literature.

3(original). The process of claim 2, wherein the booster material is characterize by a mathematical product of thermal conductivity, density, and specific heat are no more than 2.0×10^{-6} $BTU^2/sec/in^4/{}^oF^2$ at room temperature.

4(original). The process of claim 2, wherein the booster material comprises zirconia.

5(original). The process of claim 2, wherein $T-T_s$ has a range of 0.1 to 5 degrees C.

6(original). The process of claim 2, wherein $T-T_s$ is substantially 0.1 degrees C.

7(original). The process of claim 1, wherein the molded article comprises at least one layer of a data disc, and further comprising cycling the molding cavity while applying a substantially constant temperature control stimulus to the mold cavity, said cycling comprising successively and repeatedly bringing the mold cavity to a predetermined pre-injection temperature below a setting temperature of the molding material; injecting the molten molding material so as to elevate a temperature of the mold cavity at the temperature boosters to a temperature at least 10 degrees C above setting temperature of the molding material; and completely filling the mold before a flowpath in the cavity is occluded by progress of setting of the molding material in the cavity.

8(original). The process of claim 1, further comprising defining the mold cavity between relatively movable clamped-together mold parts, and permitting the mold parts to become displaced during injection of the molten molding material sufficiently that the mold cavity is temporarily enlarged to a cross sectional dimension of two to ten times a desired thickness of an article to be molded in the mold cavity.

9(original). The process of claim 8, further comprising applying a varying clamping force to the clamped-together mold parts, the clamping force being greater with completion of filling, thereby obtain the desired thickness of the article.

10(original). The process of claim 7, further comprising maintaining a thickness of the molded article by at least one of shaping the mold cavity to have a variation in thickness, compression of the mold cavity against injection pressure and coining compression of the molded article during setting.

11(original). A molding apparatus, comprising:

a mold having a plurality of mold parts defining a mold cavity substantially in a shape of an article to be molded;

wherein at least some of the mold parts comprise shaped dies defining a mold cavity, and wherein at least one of the dies is thermally coupled to a respective said mold part by at least one thermally insulating temperature booster defining a surface of the mold cavity;

wherein the thermally insulating temperature booster comprises at least one material having a mathematical product of thermal conductivity, density, and specific heat equal to no more than 2.0 X 10^{-6} BTU^2/sec/in^4/°F^2 at room temperature.

12(currently amended). The apparatus of claim 11, further comprising injection control and temperature control apparatus coupled to at least one of the mold parts and to a heated source of molding material, for injection of molten molding material into the mold cavity, and wherein the injection and temperature control apparatus are arranged in conjunction with the thermally insulating temperature booster to meet the relationships:

$(T-T_s)/(Tm-T_s) = \mathrm{erfc}(X)$

~~X= Z/(2*(α*t)^2)~~ **X=Z/(2*(α*t)^(½))**

Where: T-Ts is the amount of temperature increase to allow at the die side of booster layer. A range of 0.1 to 5 degrees C is recommended and 0.1 degree C preferred.

T_s is the temperature at the cavity surface side of the booster before contact by hot melt.

Tm is the desired cavity surface temperature during filling. A range of solidifying temperature plus 10 degrees C to 100 degrees C is recommended and the higher temperature is preferred.

α Is the thermal diffusivity of the booster layer material

t is the time to fill the cavity

Z is the thickness of the booster layer

erfc is a complementary error function. Tables of erfc that provide the value for X associated with the number from the left side of the equation are available on the internet and the literature.

13(original). The apparatus of claim 12, wherein the injection control and temperature control apparatus apply a substantially constant temperature control stimulus to the mold cavity in a mold cycling operation, successively and repeatedly bringing the mold cavity to a predetermined pre-injection temperature below a setting temperature of the molding material; injecting the molten molding material so as to elevate a temperature of the mold cavity at the temperature boosters to a temperature at least 10 degrees C above setting temperature of the molding material; and completely filling the mold before a flowpath in the cavity is occluded by progress of setting of the molding material in the cavity.

14(original). The apparatus of claim 12, further comprising a clamp for urging together the mold parts so as to define the mold cavity, wherein the clamp is arranged to permit the mold parts to become displaced during injection of the molten molding material sufficiently that the mold cavity is temporarily enlarged to a cross sectional dimension of two to ten times a desired thickness of an article to be molded in the mold cavity.

15(original). The apparatus of claim 14, wherein the clamp applies a varying clamping force to the clamped-together mold parts, the clamping force being greater with completion of filling, thereby obtain the desired thickness of the article.

16(original). The apparatus of claim 11, wherein the temperature booster material comprises zirconia.

17(original). The apparatus of claim 11, wherein the temperature booster material is provided at a recess in one of the mold parts.

18(original). The apparatus of claim 11, wherein the temperature booster extends over a distance between an inner and an outer part of the mold part, and wherein the temperature booster varies in thickness.

19(original). The apparatus of claim 11, wherein the mold part is controlled for temperature at least partly by directing a heat transfer fluid through passages in the mold part, and wherein the passages are dimensioned and spaced to complement the temperature boosters.

20(original). The apparatus of claim 19, wherein the heat transfer passages define at least two circuits controlled to different temperatures.

21(original). The apparatus of claim 11, further comprising a stamper bounding a surface of the mold cavity at least on one side of the mold cavity.

22(original). The apparatus of claim 11, wherein the mold cavity is configured to produce plastic molded parts between about 0.07 and 0.12 mm.

23(original). The apparatus of claim 11, wherein the mold cavity is configured to produce plastic molded parts between about 0.2 and 0.3 mm thick discs.

24(original). The apparatus of claim 11, wherein the mold cavity is configured to produce plastic molded parts for lamination with at least one other part to form a data storage element.